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Radio Control Pylon Racing Model Aircraft

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VOLUME F3 PYLON RACING

Section 4C – Model Aircraft – F3 – Pylon Racing

5.2 Class - F3E RC Electric Racing Aeroplanes

ANNEX F3E -A1 ENERGY LIMITERS
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1 CLASS F3E: RC ELECTRIC POWERED PYLON RACING AEROPLANES

List of abbreviations:
EDIC : Electronic Devices in Competition.
RX : Receiver
TX : Transmitter
ESC : Electronic speed Controller
BEC : Battery Eliminator Circuit

1.1 Definition of Radio Control Pylon Racing Aeroplanes

Model aircraft in which the propulsion energy is provided by an electric motor and in which the lift is obtained by aerodynamic forces acting on the supporting surfaces, which, except for the control areas, must remain fixed in flight. The power pack for the electric motor may not have any fixed connection to the ground or another model aircraft in the air

1.2 Technical Specifications of Pylon Racing Aeroplanes

1.2.1 There is no requirement for the competitor to be the builder of the model. Refer C.5.1.2. in *CIAM General Rules*.

1.2.2 A model aircraft may not be used by more than one competitor.

1.2.3. Each competitor may process and use a maximum of three models in a contest. The competitor may combine the parts of the model aircraft during the contest, provided the resulting model aircraft conforms to the rules and that the parts have been checked before the start of the contest. There is no limit to the number of used motors and batteries.

1.2.4.For the identification of models, the contest director may supply coloured stickers to the competitors to be applied on the wing surfaces. These wing stickers shall have the following properties:

i) Width between 75 and 100 mm; length equal to local wing chord.
ii) Thickness maximum 0.1 mm.
iii) Total weight of stickers maximum 3 grams.
iv) Adhesive strength more than 0.5 N/mm2.
v) Water resistant.
vi) Sufficiently flexible to follow all wing shapes.
vii) Bright colour (fluorescent recommended); two highly different colours have to be available.
ix) The ability to be peeled off without damaging wing surfaces.
x) The stickers must be positioned at the outer half of either the left or the right wing on the top and bottom sides.

1.2.5. Weight of model

Minimum weight ready to fly: 1,000 g
Maximum surface loading 65 g/dm2
In case of the use of stickers the maximum weight of the models including stickers will be increased by 6 grams.

1.2.6. If ballast is used it must be permanently and safely affixed.

1.2.7. Augmented stability systems and similar.

Augmented stability systems are allowed. Any other airborne device or function that uses sensors to actuate any control surface is prohibited (CGR par. B.1.1.e)

1.2.8. CIAM general rule CGR C.18.4 b about the nose radius of a spinner does not apply to F3E.

1.3 Power source

a) The power source shall consist of any kind of rechargeable batteries (or secondary cells), the maximum no load voltage must not exceed 21Volts (max. tolerance +0.2 Volts). In case the voltage is measured, this shall be done at the moment the preparation time for the pilot starts. After the measurement has been taken, the pilot is allowed 5 minutes preparation time before he is called to the start.

If the model aircraft carries more than the allowed number of cells as power source for the motor or the voltage exceeds this voltage, the competitor is disqualified from that heat.

b) Battery type: any type of battery with a maximum of 5 cells in series. Cells in parallel are not permitted.

Minimum weight of battery pack: 200 g

Maximum weight of battery pack: 400 g

The weight of battery includes soldering, insulation, cables and connectors.

Connector type must be 6 mm bullet. (conformity with EDIC document, Annex 1)

c) Mechanical or chemical modification of the individual cells, e.g. to reduce their weight, is not allowed except that insulation sleeves of individual cells may be changed.

1.4. Motor stop

The pilot must be able to stop the energy supply to his motor, on the ground or in the air, by radio control within five seconds of command.

The radio system used to control the aircraft shall be equipped with a fail safe. This fail safe shall be set to shut off the energy supply to the motor if radio signal is lost.

1.5 Energy limiter.

1.5.1 General.

a) Limitation of energy will be by an electronic limiter that stops the motor: max 1000 Wattmin.

b) The energy limiter is located in the electric circuit between the battery and the motor.

c) The energy limiter shall be of an EDIC approved type.

1.5.2. Technical Specifications of the energy limiter.

These are written in Annex 1. Energy limiter in F3E, From SC4_Vol_EDIC , par 2.2, 2.3 and 2.4.

See Annex A1 for full explanation and approval procedure of the energy limiters.

1.5.3. Use of limiters in competition

The organizer can use two systems of use of limiters. Only one of these two systems can be used in one contest.

The organiser must decide which of these systems he will use and indicate this clearly in the invitation.

1: Every competitor uses his own limiter

2: The organizer provides for every competitor 2 limiters, these will be drawn by competitors either every day or before every round. The organizer will provide information in the invitation for the competition how this will be done.

1.5.4. Procedure for limiter checking , malfunction of limiter.

The general procedure of limiter and logger checking follows Section C.12, Model Processing, in *CIAM General Rules*.

1.5.4.1 Processing of Energy Limiters

a)The organiser of an event has to provide equipment for energy limiter processing. The competitor must have the ability to check his limiters prior to and during the contest.

b) The organiser will check if the limiter/logger is correctly connected to RX, battery pack and ESC. There must not be any type of "jumper" or any other electronic component present in the 0V (ground) RX cable between the BEC, the Limiter and the Receiver ” or on the current sensor.

1.5.4.2 Malfunction of energy limiter

a) limiter/logger provided by the organiser: The competitor will have a reflight. This is the case when the energy limiter is measured outside the tolerance of +2/-0%. In case of negative tolerance the competitor can choose not to have a reflight and keep his result.

b) limiter/logger of the competitor: Disqualification for that round in case the 1000Wmin +2% is exceeded. No penalty or reflight will be given in case the energy limitation is measured to be less.

1.5.4.3 Infringement of energy limitation

If an infringement of energy limitation rules occurs the result of that round is discarded.

1.6. Technical checks and safety requirements

a) At registration of the model aircraft before the competition, the Technical Officer may carry out technical checks either at his own discretion or at the request of the competitor to check if the models comply with the technical specifications. However, under all circumstances during the competition, it is the competitor’s responsibility to ensure that entire model aircraft complies with the technical specifications in 1.2-1.4

b) During the competition all measuring equipment will be at the disposal of competitors to check their model aircraft if they wish to.

c) After a race, the Technical Officer may take any model aircraft for inspection (*CIAM General Rules* C.12 d)).

d) If the model aircraft is not according to the technical specifications in 1.2- 1.4 the competitor shall be disqualified from the competition. The penalties for not properly functioning or other infringements of energy limiters are described in par. 1.5.

e) The Contest Director has the right to request any competitor to make a flight to demonstrate the airworthiness of his model aircraft.

f) Safety inspections of all aircraft before or during registration and at random as a pre-flight check during the competition shall be conducted by the contestant under the supervision of the Technical Officer.

The list of checks should include the following:

i) Electric safety of battery and its connections.

ii) Push/pull rods or cables, control horns, and servo leads shall be installed in such a way that they will not become disconnected in flight. Clevises shall be physically held closed by short pieces of fuel tubing or similar material. Metal clevises shall be protected from deterioration of the threads due to vibration by means of a lock nut, thread treatment such as Loctite ® or Vibra-tite ®, or a similar method. Ball links shall be tight.

iii) All mounting screws of the motor shall be in place and secure.

iv) Control surfaces shall be firm on the hinge line without excessive play.

v) Wings, if removable, shall be securely attached to the fuselage with bolts or machine screws.

vi) The aircraft shall be free of stress cracks and any other indications of structural damage.

vii) Proper functioning of the motor stop by fail safe.

viii) Proper fixation of ballast.

g) If a model aircraft does not comply with the technical of safety items during a pre-flight check, the Technical Officer will not allow it to fly in the race.

1.7 Competitors

a) A race team shall consist of a pilot and a caller. All pilots must be accompanied by a caller for reasons of safety. The caller may be the team manager, another competitor from the same national team or a third party. In all cases the caller must be the holder of an FAI licence, not necessarily issued by the NAC of the pilot, and must have paid an entry fee.

b) Each pilot and mechanic/caller shall be registered as a team from the beginning of the competition through to its end. In special cases (injury, illness or the like) the caller may be changed during the competition, but only with permission of the contest director.

c) Not withstanding b) above, the pilot or caller of one race team may act as the caller in one or more race teams of his national team. However, once registered, pilot/caller roles may not be interchanged in a race team nor may a caller registered with one national team act as a caller for any other national team with the following exception: In case a national team consists of only one competitor the caller may be a member of another national team. A caller can operate in this case in only one other national team than his own national team.

d) In each race, the caller must release the model aircraft at the start and give the pilot verbal information regarding the flying course of his model aircraft and any official signals.

e) Electronic communication with the pilot of any kind shall be prohibited.

f) There will be no pilots' helpers at any of the pylons.

g) The Contest Director has the right to request any competitor to make a flight to demonstrate his ability to fly the aircraft around the course

1.8. Helmets

a) All officials, competitors and callers on the racecourse must wear a crash helmet with a properly fastened chin strap. Helmets must be worn during practice and during the competition.

b) During the competition, any pilot or caller not wearing an appropriate helmet will disqualify that team from the heat.

c) During practice, any pilot or caller not wearing an appropriate helmet will not be permitted to fly and if already flying will be instructed to land immediately and will not be permitted to fly again until both members of the team are wearing helmets.

1.9 Transmitter and frequency check

a) For transmitter and frequency checks see *CIAM General Rules* C.16.2. Spread spectrum (2.4 GHz) technology may be used and if all competitors do, then C.16.2.2 may not apply.

b) Heats shall be arranged in accordance with the radio frequencies in use to permit simultaneous flights, taking into account that frequency will not follow frequency.

c) Each competitor has to supply two different frequencies, separated by a minimum of 20 kHz, which he must be able to use on all his model aircraft entered in the competition.

1.10 Race Course, Distance and Number of Rounds

a) The race course is a triangle with sides of 40 metres, 180 meters and 180 metres, marked by 3 pylons. In this triangle an area in the shape of, and to the dimensions and location as shown on the diagram F3E course layout at the end of this paragraph, is specified, wherein, for reasons of safety, all pilots, callers and the Starter have to stay during a race. This area will be called the pilot's area.

Three starting lanes are defined. These are approximately 3 meters wide and extend from 7 meters behind the start/finish line to the start/finish line. The No 1 starting lane is closest to pylon # 2.

In case of tail wind the course direction should be changed, if possible.

If this is not possible due to physical or time constraints and when there is a strong tail wind (>5 m/s) the starter can decide a 180^{o} change of take-off direction at least 10 minutes before the first heat of a round. This direction of launch shall be continued for that complete round.

See F3E course Layout for take off in opposite direction with adjusted start lanes. In this case the start line is the back-line of the pilots area. Safe positions of the pilots will be secured by the starter.

b) The race course specification may be modified in the interest of safety or to suit existing field conditions if as long as safety is not compromised and subject always to strict compliance with rule 1.10.a.

c) Annex 5Q gives guidelines for the lay-out and organisation of the flying site in order to achieve maximum safety for competitors, judges and spectators.

d) The pylons should have a minimum height of 4 m and should not exceed 5 m in height.

e) Pylons shall be made of a rigid material at least 70mm in diameter at any point. The pylons must be finished in a bright colour in order to enhance visibility.

f) The race is over 10 laps with an individual nominal length of 400 m and total nominal flying distance of 4000 m.

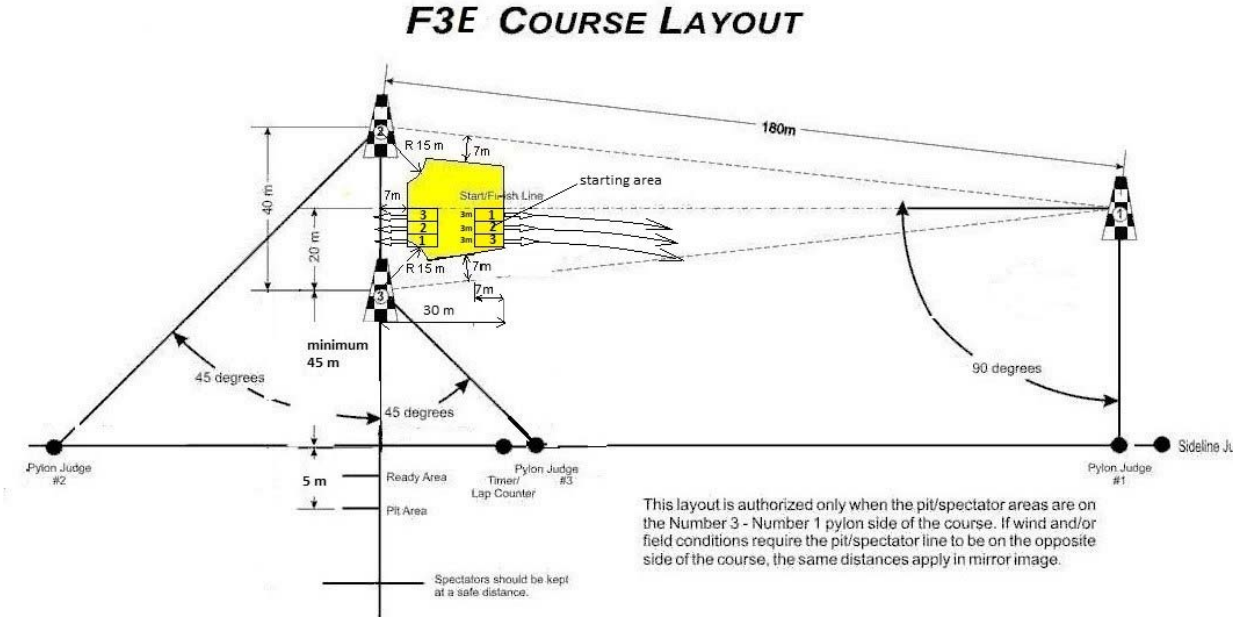
g) The race starts at the start-finish line. The race is terminated at the start -finish line 10 full laps later.

h) The number of rounds will be announced by the organiser before the start of the competition with a minimum of 3 and a maximum of 15. Because of weather conditions or other important reasons, the number of rounds may be reduced during the competition, but only after consultation with the team managers or the competitors in an early a stage as possible. See also A.5V.5 and A.5V.6.

i) Each competitor will have a minimum of 20 minutes preparation time between flights in different rounds or before a reflight in the same round to allow his motor to cool down. This 20 minutes period starts when the competitor exits the course or the after flight processing

F3E RACE COURSE LAYOUT (1.10a and 1.10.b)

(note: drawing needs better quality and flight paths will be added for reverse start)



1.11 Race from Start to Finish

a) Annex 5R describes the duties of the Contest Director, Starter, Judges and other

personnel.

b) Annex 5T describes the draw of races.

c) A maximum of three model aircraft per heat will be allowed.

d) All pilots and callers (and the Starter) have to stay within the pilots' area (see race course layout in 5.2.7.16b). If the pilot or the caller intentionally steps out of this pilot's area with both feet (to be judged by the Starter) then this will be penalised as an infringement. The Starter will take care that pilots are sufficiently separated and will take preventive action if a collision between pilots or their transmitter antennas is likely to occur.

e) Starting positions in all races will be determined by draw with the No.1 lane being closest to No 2 pylon.

f) The Race Starter is in charge of each heat. The Starter will ensure that all competitors and race officials are ready to commence. Each Timekeeper and Pylon Judge will have a signal of a distinctive colour. The Starter will arrange for each model aircraft to be identified by the Timekeepers and Pylon Judges before the start of any heat. A radio operation check from each competitor, judged by the Starter will be made prior to starting engine(s).

g) A 10 seconds period will be allowed after the starter has made sure everyone is ready to go. The race starts immediately after the 10 seconds period. No competitor shall be permitted to take off once the first model aircraft has passed the start/finish line heading from N°. 1 to N°. 2 pylon on the first lap, and no time shall be given him for that heat.

h) All take-offs will be hand launched by the caller. No mechanical device may be used to assist the aircraft to take-off.
Only hand pushing is permitted. Other throwing techniques, like discus throw type are forbidden.
Before and during launch the caller is, for safety reasons, not allowed outside his take-off lane which is defined as the lane of given width (approximately 3 meter) , between the start line and 7 meters behind the start line, see 1.10 F3E race course lay-out.
i) The Model aircraft shall be launched within 2 meters of the start line on the starting signal (flag drop or light signal) at one-second intervals with timing commencing at the starting signal for that particular model aircraft.
The caller must launch the model within +/-45° of the given launch direction.

j) An early start (the model passing the start line before the starting signal) or a start in a wrong direction will be penalised as an infringement.

l) After the starting signal is given, any contact between model aircraft shall be considered a collision and the model aircraft involved must land immediately. If a competitor fails to stop racing immediately after the collision, then he will be disqualified from that round,

m) If l) above occurs, and the Contest Director is of the opinion that the aircraft is still airworthy, or the competitor has an airworthy reserve model aircraft, then the competitor shall be entitled to a second opportunity to record a score in that round.

n) All laps are to be flown counter-clockwise with turns to the left.

o) Over-flying the sideline shall be considered dangerous and will be penalised as an infringement (to be judged by the sideline judge).

p) Persistent flying below the top of the pylons shall be considered dangerous. After passing the first pylon on the first lap of the race, low flying is considered persistent when the model aircraft flies below the height of three consecutive pylons. Below a pylon height means that any part of the model is below the pylon height. This will be judged by the timekeeper and N° 1 pylon judge. An infringement will be given after confirmation by both parties. A dedicated official may be used for this purpose.

q) Cutting a pylon (to be judged by the pylon judges or the sideline judge) be penalised as an infringement.

r) In the event of a malfunction of the timing, lap counting, signalling or other such equipment which is the responsibility of the organisers, any competitor(s) affected by such malfunction shall be given the opportunity to record a score for that round.

s) If during the race, the Starter or the sideline judge considers any model aircraft to be flying erratically, dangerously, or so uncontrolled as to endanger pilots, callers or course officials, the Starter shall instruct the pilot to land immediately. The pilot shall be disqualified from that heat or the Contest Director may disqualify him from the competition.

t) At the completion of the 10 laps, the Starter must immediately instruct the competitor to remove his aircraft from the course and to stop the energy supply to his motor within 10 seconds. If he does not do this within 10 seconds after the Starter's command, the competitor shall be disqualified for that flight (to be judged by the Starter). In certain circumstances the Starter may allow a competitor to continue to fly for a short time, e.g to allow the limiter to be emptied to have no limiter surprises at landing.
If there is a need to continue to fly for a short time after the end of the race this must be announced to the Starter. Only two straight runs (e.g. for trimming the model) will be accepted.

u) At the completion of a heat, all aircraft must be landed in an area designated by the Contest Director. No pilots or callers may enter the designated landing area until all aircraft have completed landing to a full stop. Contravention of this rule, to be judged by the Starter, shall incur disqualification from the heat.

v) After the power supply to all motors has stopped, the pilots and callers may leave the pilots' area and move to positions (to be advised by the Starter before the race starts) close to, but not inside, the designated landing area from where they may land their models.

w) After the starting signal (flag drop or light signal) and before the power supply to the engine stops, the loss of any part of the model aircraft, except as a result of a collision where 5.2.17 l) applies, disqualifies the competitor for that flight.

x) The race is finished, when all models have landed and have come to a full stop.

1.14 Timekeeping and Judging

Annex 5R describes the duties of timekeepers and judges.

a) All officials (timekeepers, lap counters and pylon judges) must stay at a minimum distance of 45 m outside the course as drawn on the F3E course lay-out in 1.10.

b) Flight timers and lap counters: Each competitor shall be assigned one officer during each heat. This officer will time the competitor's aircraft for the required ten laps. In doing so he will count the laps flown and advise the pilot when he has completed the necessary 10 laps. He will keep the recorded time on his timing device until he has entered the time on the score sheet under the supervision of the Starter.

c) On the start/finish line an electronic activated signal will be provided for each competitor. The No 1 pylon judges will operate these signals. These judges shall signal the competitor when the competitor's aircraft has passed the No 1 pylon. The pylon judges will be located on the course as described in the race course layout diagram (5.2.16 (b). Each pylon judge will have a distinctive colour allocated, and the Starter will arrange for each model aircraft to be identified by the allocated pylon judge before the start of every heat.

d) The judges' signals will be off as the aircraft reach midcourse between No. 3 and No. 1 pylons, or earlier. At the instant the model aircraft draws level with the No. 1 pylon the pylon judge will switch his signal on. When the model aircraft draws level with the No.1 pylon on the way back the signal is switched off. When a pylon cut has been made the signal will flash on and off 5 times or another signal will be activated to inform the competitor about the pylon cut.

e) At the No 2 and No 3 pylons, the pylon judges will place themselves in a position in accordance with the race course layout diagram (5.2.16 (b) to the pylon they are judging.

f) The judges at N° 2 and N° 3 pylons will record a cut pylon infringement.

g) Two sideline judges will be posted near the N°1 pylon judges on the spectator side of the racing course. The sideline judges will record as an infringement any over-flight of the sideline and any flight below the height of the pylon.

h) A sideline judge will be posted in front of the pit area on the spectator side of the racing course. The sideline judges will record as an infringement, any over-flight of the pit or spectator areas.

i) At the end of each race the sideline and pylon judges will inform the Starter of any infringement by any competitor.

1.15 Infringements and Penalties

a) For reasons of clarity, all infringements that are mentioned in the rules, the judges that are judging them and the corresponding penalties are summarised in the table overleaf.

b) See paragraph 1.16 Scoring and Classification, for the effects of disqualification and infringements on a competitor's score.

c) Only the Contest Director may disqualify a competitor from the competition.

Table of Infringements & Penalties			
Paragraph	**Subject**	**Judged & Applied By**	**Penalty**
1.3.a) 1.3.b)	Battery has more than 21.2 Volts no load voltage or more than 5 cells.	Technical director	DQ from heat
1.5.4.2.b)	limiter/logger of the competitor: 1000Wmin +2% is exceeded	Technical director	DQ from heat
1.5.4.1.b) 1.5.4.3	Infringement of energy limitation	Technical director	DQ from heat
1.6.d)	At after-race processing, model aircraft is not according to technical specifications 1.2	Technical Officer, Contest Director	DQ from competition
1.6.e) 1.7.g)	Cannot prove airworthiness of model aircraft or capability of pilot	Contest Director	DQ from competition
1.6	Model aircraft does not pass pre-flight check	Technical Officer, Contest Director	DQ from heat
1.8.b)	Not wearing of helmets (pilot/caller)	Starter	DQ from heat
1.9.c)	Not having multiple frequencies (if not using 2.4GHz)	Contest Director	DQ from competition
1.11.d)	Pilot or caller intentionally stepping out of the pilots' area with both feet	Starter	1 infringement
1.11.g)	Too late start	Starter	DQ from heat
1.11.h.i)	Caller outside starting lane before and during launch.	Starter	1 infringement
1.11.h.i)	Launch more than 2 meter from start line	Starter	1 infringement
1.11.h.i)	Launch more than +/-45° of the given launch direction.	Starter	1 infringement
1.11.j)	Too early start	Starter	1 infringement
1.11.o)	Flying outside safety line	Sideline Judge	1 infringement
1.11.p)	Flying below pylon height	Sideline Judge Pylon Judge	1 infringement

1.11.q)	Pylon cut	Pylon Judge	1 infringement
1.11.s)	Erratic, dangerous or uncontrolled flying	Starter, Sideline Judge,	DQ from heat
1.11.s)	Erratic, dangerous or uncontrolled flying	Contest Director	DQ from competition
1.11.t)	Failing to stop engine within 10 seconds from Starter's command	Starter	DQ from heat
1.11.u)	Landing outside designated landing area	Starter	DQ from heat
1.11.u)	Pilot or caller entering the landing area before all model aircraft have landed and stopped	Starter	DQ from heat
1.11.w)	The loss of any part of model aircraft	Starter, Sideline Judge	DQ from heat

1.16 Scoring and Classification

a) The flight of each model aircraft shall be timed by a lap counter/timekeeper with a timing device measuring to at least 1/100th of a second). Timing shall start when the starting signal is given to the individual competitor.

b) The lap counter/timekeeper stops his timing device after ten laps have been completed by the competitor and, supervised by the Starter, records the elapsed time from the timing device on the competitor's score sheet.

c) At the completion of each heat, the pylon and side-line judges shall notify the Starter as to which model aircraft, if any, have had infringements recorded against them. The Starter then advises the lap counters/timekeepers assigned to those aircraft who will record the total number of infringements for each competitor on his score sheet.

d) The score sheets are then processed by a scorekeeper who:

   i) for one infringement, will add 1/10th of the flyer's time for ten laps to give the corrected time;

   ii) for two or more infringements, will give a score of 200.

e) Points shall be awarded after each race as follows: The competitor's score shall be his corrected time in seconds and hundredths of a second. If the competitor fails to complete his flight or is disqualified his score shall be 200.

f) The winner of the event is the competitor who has accumulated the lowest score after the conclusion of all heats. If four or more rounds are flown, each competitor's worst (highest) score shall be discarded. If eight *or* more rounds are flown, each competitor's worst (highest) two scores shall be discarded. If twelve or more rounds are flown, each competitor's worst (highest) three scores shall be discarded.

g) If the time permits and there is no frequency conflict, ties shall be broken by a fly-off race. Otherwise, the best single race score shall be considered in resolving a tie.

1.15.1 Team Classification

To establish the scores for the international team classification, add the final individual scores of the members of the team. Teams are ranked according to the lowest numerical score to highest, with complete three-competitor teams ahead of two-competitor teams which in turn are ranked ahead one-competitor teams (*CIAM General Rules* C.15.6.2 a) ii)). In a case of a team tie, the team with the lower sum of place numbers, given in order from the top, wins. If still equal, the best individual placing decides.

1.15.2 Awards

Awards will be given in compliance with *CIAM General Rules* C.15.6. Callers will be awarded with diplomas only.